WHAT IS CLAIMED IS:

1. A method for determining a signal pitch, comprising:

(a) applying a first signal x[i+k] and a second signal x[i-L+k] where k is an integer from 0 to M-1, corresponding to a signal before a sample L of the first signal x[i+k] to a first membership function μ_L that is a membership function of a first fuzzy set including large values, obtaining a minimum value therebetween, and obtaining a probability (P1) that the first signal x[i+k] and the second signal x[i-L+k] have large values for 0<= k <= (M-1);

(b) applying the first signal x[i+k] and the second signal x[i-L+k] to a second membership function μ_s, which is a membership function of a second fuzzy set including small values, obtaining a minimum value therebetween, and obtaining a probability (P2) that the first signal x[i+k] and the second signal x[i-L+k] have small values for 0<= k <= (M-1);

(c) obtaining a maximum value between the probability P1 and the probability (P2), and generating a probability (P3) that the first signal x[i+k] and the second signal x[i-L+k] have the large values or the small values ;

(d) increasing said k in units of integers from 0 to M-1, repeating (a) through (c), and obtaining M said probabilities P3;

(e) obtaining a correlation coefficient indicating a degree of similarity between the first signal x[i+k] and the second signal x[i-L+k] by adding said M said probabilities P3;

(f) varying said sample L in a range, and repeating (a) through (e); and

(g) determining said sample L corresponding to a maximum value among a plurality of said correlation coefficients obtained in (e) as a pitch of the first signal x[i+k].

2. The method of claim 1, wherein the first membership function is represented by $\mu_L(w)=(w+R)/2R$, and the second membership function $\mu_s(w)=(-w+R)/2R$ where R is a positive real number, and $-R<=w<=R$), and (a) and (b) are performed using the first membership function and the second membership function, such that a minimum value between the first signal x[i+k] and the second signal x[i-L+k] is determined as the probability P1, and a minimum value between –x[i+k] and –x[i-L+k] obtained by adding a negative symbol to the first signal x[i+k] and the second signal x[i-L+k] for 0<= k <= (M-1) is determined as the probability P2.

3. A method for determining a signal pitch, comprising:

(a) applying a first signal x[i+k] and a second signal x[i-L+k] for a sample L to the following equation and obtaining a probability P3 that the first signal x[i+k] and the second signal x[i-L+k] have large values or small values:

$$\max[\min(\mu_L(x[i+k]), \mu_L(x[i-L+k])), \min(\mu_s(x[i+k], \mu_s(x[i-L+k]))],$$

where k is an integer from 0 to M-1, said μ_L is a first membership function that is a membership function of a first fuzzy set having said large values, and said μ_s is a second membership function that is a membership function of a second fuzzy set having said small values;

(b) increasing said k in units of integers from 0 to M-1, repeating (a), and obtaining M said probabilities P3;

(c) obtaining a correlation coefficient indicating a degree of similarity between the first signal x[i+k] and the second signal x[i-L+k] by adding said M probabilities P3;

(d) varying said sample L in a predetermined range and repeating (a) through (c); and

(e) determining said sample L corresponding to a maximum value among a plurality of correlation coefficients obtained in (c) as a pitch of the first signal x[i+k].

4. The method of claim 3, wherein the first membership function is represented by $\mu_L(w)=(w+R)/2R$, and the second membership function is represented by $\mu_s(w)=(-w+R)/2R$, and by applying the first membership function and the second membership function to the above equation in (a), the probability P3 is obtained by the following equation:

$$\max[\min(x[i+k]), x[i-L+k]), \min(-x[i+k], -x[i-L+k])].$$

5. The method of claim 4, wherein (a) comprises:

(a1) deciding a corresponding symbol for each of the first signal x[i+k] and the second signal x[i-L+k]; and

(a2) receiving symbol information of the first signal x[i+k] and the second signal x[i-L+k] and obtaining the probability P3 according to the following table:

X[I+k]	x[i-L+k]	P3
+	+	min(x[i+k], x[i-L+k])
-	-	min(-x[I+k], -x[i-L+k])
+	-	-min(x[I+k], -x[i-L+k])
-	+	-min(-x[I+k], x[i-L+k])

6. The method of claim 4, wherein (a) comprises:

(a1) obtaining a minimum value between the first signal x[i+k] and the second signal x[i-L+k];

(a2) obtaining a minimum value between values obtained by adding a negative symbol to each of the first signal x[i+k] and the second signal x[i-L+k]; and

(a3) obtaining a maximum value between the minimum value obtained in (a1) and the minimum value obtained in (a2), and obtaining the probability P3.

7. A method for determining a correlation coefficient between signals, the method comprising:

(a) applying a first signal x[i+k] and a second signal y[j+k], where k is an integer from 0 to M-1, to a first membership function μ_L of a first fuzzy set having large values, obtaining a minimum value therebetween, and obtaining a probability P1 that the first signal x[i+k] and the second signal y[j+k] have said large values for 0<= k <= (M-1);

(b) applying the first signal x[i+k] and the second signal y[j+k] to a second membership function μ_s of a second fuzzy set having small values, obtaining a minimum value therebetween, and obtaining a probability P2 that the first signal x[i+k] and the second signal y[j+k] have the small values for 0<= k <= (M-1);

(c) obtaining a maximum value between the probability P1 and the probability P2 and obtaining a probability P3 that the first signal x[i+k] and the second signal y[j+k] have the large values or the small values;

(d) increasing said k in units of integers from 0 to M-1, repeating (a) through (c), and obtaining M probabilities P3; and

(e) obtaining a correlation coefficient indicating a degree of similarity between the first signal x[i+k] and the second signal y[j+k] by adding said M probabilities P3 for 0<= k <= (M-1).

8. The method of claim 7, wherein the first membership function is represented by $\mu_L(w)=(w+R)/2R$, and the second membership function is represented by $\mu_s(w)=(-w+R)/2R$, where R is a positive real number, and $-R<=w<=R$, and (a) and (b) are performed using the first membership function and the second membership function such that a minimum value between the first signal x[i+k] and the second signal y[j+k] is determined as the probability P1 and a minimum value between –x[i+k] and –y[j+k] obtained by adding a negative symbol to each of the first signal x[i+k] and the second signal y[j+k] is determined as the probability P2 for 0<= k <= (M-1).

9. A method for determining a correlation coefficient between signals, comprising:

(a) applying a first signal x[i+k] and a second signal y[j+k] to the following equation and obtaining a probability P3 that the first signal x[i+k] and the second signal y[j+k] have large values or small values:

$$\max[\min(\mu_L(x[i+k]), \mu_L(y[j+k])), \min(\mu_s(x[i+k], \mu_s(y[j+k]))],$$

where k is an integer from 0 to M-1, said μ_L is a first membership function that is a membership function of a first fuzzy set having said large values, and said μ_s is a second membership function that is a membership function of a second fuzzy set having said small values;

(b) increasing said k in units of integers from 0 to M-1, repeating (a), and obtaining M probabilities P3; and

(c) obtaining a correlation coefficient indicating a degree of similarity between the first signal x[i+k] and the second signal y[j+k] by adding said M probabilities P3.

10. The method of claim 9, wherein the first membership function is represented by $\mu_L(w)=(w+R)/2R$, and the second membership function is represented by $\mu_s(w)=(-w+R)/2R$, and by applying the first membership function and the second membership function to the above equation in (a), the probability P3 is obtained by the following equation:

$$\max[\min(x[i+k]), y[j+k]), \min(-x[i+k], -y[j+k])].$$

11. The method of claim 10, wherein (a) comprises:

(a1) deciding symbols of the first signal x[i+k] and the second signal y[j+k]; and

(a2) receiving symbol information of the first signal x[i+k] and the second signal y[j+k]and obtaining the probability P3 according to the following table:

x[i+k]	y[j+k]	P3

+	+	min(x[i+k], y[j+k])
-	-	min(-x[i+k], -y[j+k])
+	-	-min(x[i+k], -y[j+k])
-	+	-min(-x[i+k], y[j+k])

12. The method of claim 10, wherein (a) comprises:

(a1) obtaining a minimum value between the first signal x[i+k] and the second signal y[j+k];

(a2) obtaining a minimum value between values obtained by adding a negative symbol to each of the first signal x[i+k] and the second signal y[j+k]; and

(a3) obtaining a maximum value between the value obtained in (a1) and the value obtained in (a2) and obtaining the probability P3.

13. An apparatus for determining a signal pitch, comprising:

an operation unit which receives a first signal x[i+k] and a second signal x[i-L+k] where k is an integer from 0 to M-1, said second signal x[i-L+k] corresponding to a signal before a sample L of the first signal x[i+k], applies the first signal x[i+k] and the second signal x[i-L+k] to a first membership function μ_L of a first fuzzy set having large values, obtains a minimum value therebetween, and obtaining a probability P1 that the first

signal x[i+k] and the second signal x[i-L+k] have large values, applies the first signal x[i+k] and the second signal x[i-L+k] to a second membership function μ_s of a second fuzzy set having small values, obtains a minimum value therebetween, obtains a probability P2 that the first signal x[i+k] and the second signal x[i-L+k] have small values, obtains a maximum value between the probability P1 and the probability P2, obtains a probability P3 that the first signal x[i+k] and the second signal x[i-L+k] have the large values or the small values, increases said k in units of integers from 0 to M-1, repeats the above operations on a pair of the first signal x[i+k] and the second signal x[i-L+k] corresponding to said k, and obtains M probabilities P3;

an addition unit that obtains a correlation coefficient indicating a degree of similarity between the first signal x[i+k] and the second signal x[i-L+k] by adding said M probabilities P3;

wherein as said sample L is varied in a range, the operation unit determines the probabilities P3 for each value of the sample L and outputs a result of said determination to the addition unit, and the addition unit determines a correlation coefficient by adding said M probabilities P3 for each value of the sample L and outputs a plurality of correlation coefficients; and

a pitch determination unit that determines the sample L corresponding to a maximum value among the plurality of correlation coefficients input from the addition unit as a pitch of the first signal x[i+k].

14. The apparatus of claim 13, wherein the first membership function is represented as $\mu_L(w)=(w+R)/2R$, and the second membership function is represented as $\mu_s(w)=(-w+R)/2R$, where R is a positive real number, and $-R<=w<=R$, and the operation unit performs an operation for obtaining the probability P1 and the probability P2 using the first membership function and the second membership function, such that a minimum value between the first signal x[i+k] and the second signal x[i-L+k] is determined as the probability P1 and a minimum value between –x[i+k] and –x[i-L+k], obtained by adding a negative symbol to each of the first signal x[i+k] and the second signal x[i-L+k], is determined as the probability P2 for 0<= k <= (M-1).

15. An apparatus for determining a signal pitch, comprising:

an operation unit which receives a first signal x[i+k] and a second signal x[i-L+k] where k is an integer from 0 to M-1, said second signal x[i-L+k] corresponding to a signal before a sample L of the first signal x[i+k], applies the first signal x[i+k] and the second signal x[i-L+k] to the following equation:

$$\max[\min(\mu_L(x[i+k]), \mu_L(x[i-L+k])), \min(\mu_s(x[i+k], \mu_s(x[i-L+k]))]$$

where said μ_L is a first membership function of a first fuzzy set having large values, and said μ_s is a second membership function of a second fuzzy set having small values,

wherein said operation unit obtains a probability P3 that all of the first signal x[i+k] and the second signal x[i-L+k] have the large values or the small values, increases said k in units of integers from 0 to M-1, repeats the above operations on a pair of the first signal x[i+k] and the second signal x[i-L+k] corresponding to said k, and obtains M probabilities P3;

an addition unit that obtains a correlation coefficient indicating a degree of similarity between the first signal x[i+k] and the second signal x[i-L+k] by adding said M probabilities P3 input from the operation unit;

wherein as said sample L is varied in a predetermined range, the operation unit determines the probabilities P3 for each value of the sample L and outputs the result of said determination to the addition unit, and the addition unit determines a correlation coefficient by adding said M probabilities P3 for each value of the sample L and outputs a plurality of correlation coefficients; and

a pitch determination unit which determines the sample L corresponding to a maximum value among the plurality of correlation coefficients input from the addition unit as a pitch of the first signal x[i+k].

16. The apparatus of claim 15, wherein the first membership function is represented by $\mu_L(w)=(w+R)/2R$, and the second membership function is represented by $\mu_s(w)=(-w+R)/2R$, and the operation unit obtains the probability P3 by the following equation using the first membership function and the second membership function:

$$\max[\min(x[i+k]), x[i-L+k]), \min(-x[i+k], -x[i-L+k])].$$

17. The apparatus of claim 16, wherein the operation unit comprises:

a symbol decision unit that decides symbols of the first signal x[i+k] and the second signal x[i-L+k]; and

a maximum value determination unit that receives symbol information of the first signal x[i+k] and the second signal x[i-L+k] and obtains the probability P3 according to the following table:

x[i+k]	x[i-L+k]	P3
+	+	min(x[I+k], x[i-L+k])
-	-	min(-x[I+k], -x[i-L+k])
+	-	-min(x[I+k], -x[i-L+k])
-	+	-min(-x[I+k], x[i-L+k])

18. The apparatus of claim 16, wherein the operation unit comprises:

a first minimum value operation unit that receives the first signal x[i+k] and the second signal x[i-L+k], obtains a minimum value therebetween, and outputs the minimum value;

a second minimum value operation unit that receives the first signal x[i+k] and the second signal x[i-L+k], obtains a minimum value between values obtained by adding a negative symbol to each of the first signal x[i+k] and the second signal x[i-L+k], and outputs the minimum value; and

a maximum value operation unit that receives a value output from the first minimum value operation unit and a value output from the second minimum value operation unit, obtains a maximum value therebetween, and obtains the probability P3.

19. An apparatus for determining a correlation coefficient between signals, comprising:

an operation unit that receives a first signal x[i+k] and a second signal y[j+k], where k is an integer from 0 to M-1, applies the first signal x[i+k] and the second signal y[j+k] to a first membership function μ_L of a first fuzzy set having large values, obtains a minimum value therebetween, obtains a probability P1 that the first signal x[i+k] and the second signal y[j+k] have

large values, applies the first signal x[i+k] and the second signal y[j+k] to a second membership function μ_s of a second fuzzy set having small values, obtains a minimum value therebetween, obtains a probability P2 that the first signal x[i+k] and the second signal y[j+k] have small values, obtains a maximum value between the probability P1 and the probability P2, obtains a probability P3 that the first signal x[i+k] and the second signal y[j+k] have the large values or the small values, increases said k in units of integers from 0 to M-1, repeats the above operations on the first signal x[i+k] and the second signal y[j+k] corresponding to said k, and obtains M probabilities P3; and

an addition unit that obtains a correlation coefficient indicating a degree of similarity between the first signal x[i+k] and the second signal y[j+k] by adding said M probabilities P3 input from the operation unit.

20. The apparatus of claim 19, wherein the first membership function is represented by $\mu_L(w)=(w+R)/2R$, and the second membership function is represented by $\mu_s(w)=(-w+R)/2R$, where R is a positive real number and $-R<=w<=R$, and the operation unit performs an operation for obtaining the probabilities P1 and p2 using the first membership function and the second membership function such that a minimum value between the first signal x[i+k] and the second signal y[j+k] is determined as the probability P1 and a minimum value between –x[i+k] and –y[j+k] obtained by adding a negative symbol to each of the first signal x[i+k] and the second signal y[j+k] is determined as the probability P2.

21. An apparatus for determining a correlation coefficient between signals, comprising:

an operation unit which receives a first signal x[i+k] and a second signal y[j+k] where k is an integer from 0 to M-1, applies the first signal x[i+k] and the second signal y[j+k] to the following equation:

$$\max[\min(\mu_L(x[i+k]), \mu_L(y[j+k])), \min(\mu_s(x[i+k], \mu_s(y[j+k]))]$$

where said μ_L is a first membership function of a first fuzzy set having large values, and said μ_s is a second membership function of a second fuzzy set having small values,

obtains a probability P3 that the first signal x[i+k] and the second signal y[j+k] have large or small values, increases said k in units of integers from 0 to M-1, repeats the above operations on a pair of the first signal x[i+k] and the second signal y[j+k] corresponding to said k, and obtains M probabilities P3; and

an addition unit that obtains a correlation coefficient indicating a degree of similarity between the first signal x[i+k] and the second signal y[j+k] by adding said M probabilities P3.

22. The apparatus of claim 21, wherein the first membership function is represented by $\mu_L(w)=(w+R)/2R$, and the second membership

function is represented by $\mu_s(w)=(-w+R)/2R$, and the operation unit obtains the probability P3 by the following equation using the first membership function and the second membership function:

$$\max[\min(x[i+k]),\ y[j+k]),\ \min(-x[i+k],\ -y[j+k])]$$

.

23. The apparatus of claim 22, wherein the operation unit comprises:

a symbol decision unit that decides symbols of the first signal x[i+k] and the second signal y[j+k]; and

a maximum value determination part which receives symbol information of the first signal x[i+k] and the second signal y[j+k] and obtains the probability P3 according to the following table:

x[I+k]	y[j+k]	P3
+	+	min(x[I+k], y[j+k])
-	-	min(-x[i+k], -y[j+k])
+	-	-min(x[i+k], -y[j+k])
-	+	-min(-x[I+k], y[j+k])

24. The apparatus of claim 22, wherein the operation unit comprises:

a first minimum value operation unit which receives the first signal x[i+k] and the second signal y[j+k], obtains a minimum value therebetween, and outputs the minimum value;

a second minimum value operation unit that receives the first signal x[i+k] and the second signal y[j+k], obtains a minimum value between values obtained by adding a negative symbol to each of the first signal x[i+k] and the second signal y[j+k], and outputs a maximum value; and

a maximum value operation part which receives a value output from the first minimum value operation part and a value output from the second minimum value operation part, obtains a maximum value therebetween, and obtains the probability P3.

25. A computer readable recording medium on which a program for implementing a method for determining a signal pitch is recorded, said program having instructions comprising:

(a) applying a first signal x[i+k] and a second signal x[i-L+k], where k is an integer from 0 to M-1, the second signal x[i-L+k] corresponding to a signal before a sample L of the first signal x[i+k], to a first membership function μ_L of a first fuzzy set having large values, obtaining a minimum value therebetween, and obtaining a probability P1 that the first signal x[i+k] and the second signal x[i-L+k] have said large values;

(b) applying the first signal x[i+k] and the second signal x[i-L+k] to a second membership function μ_s of a second fuzzy set having small values,

obtaining a minimum value therebetween, and obtaining a probability P2 that all of the first signal x[i+k] and the second signal x[i-L+k] have said small values;

(c) obtaining a maximum value between the probability P1 and the probability P2 and obtaining a probability P3 that the first signal x[i+k] and the second signal x[i-L+k] have said large values or said small values;

(d) increasing said k in units of integers from 0 to M-1, repeating (a) through (c), and obtaining M probabilities P3;

(e) obtaining a correlation coefficient indicating a degree of similarity between the first signal x[i+k] and the second signal x[i-L+k] by adding said M probabilities P3;

(f) varying said sample L in a predetermined range and repeating (a) through (e); and

(g) determining said sample L corresponding to a maximum value among a plurality of correlation coefficients obtained in (e) as a pitch of the first signal x[i+k].

26. A computer readable recording medium on which a program for implementing a method for determining a signal pitch is recorded, said program having instructions comprising:

(a) applying a first signal x[i+k] and a second signal x[i-L+k] to the following equation and obtaining a probability P3 that the first signal x[i+k] and the second signal x[i-L+k] have large values or small values:

$$\max[\min(\mu_L(x[i+k]),\ \mu_L(x[i-L+k])),\ \min(\mu_s(x[i+k],\ \mu_s(x[i-L+k]))]$$

where k is an integer from 0 to M-1, said μ_L is a first membership function of a first fuzzy set having large values, and said μ_s is a second membership function of a second fuzzy set having small values;

(b) increasing said k in units of integers from 0 to M-1, repeating (a), and obtaining M probabilities P3;

(c) obtaining a correlation coefficient indicating a degree of similarity between the first signal x[i+k] and the second signal x[i-L+k] by adding said M probabilities P3;

(d) varying said sample L in a predetermined range and repeating (a) through (c); and

(e) determining said sample L corresponding to a maximum value among a plurality of correlation coefficients obtained in (c) as a pitch of the first signal x[i+k].

27. A computer readable recording medium on which a program for implementing a method for determining a correlation coefficient between signals is recorded, said program having instructions comprising

(a) applying a first signal x[i+k] and a second signal y[j+k], where k is an integer from 0 to M-1, to a first membership function μ_L of a first fuzzy set having large values, obtaining a minimum value therebetween, and obtaining a probability P1 that the first signal x[i+k] and the second signal y[j+k] have said large values;

(b) applying the first signal x[i+k] and the second signal y[j+k] to a second membership function μ_s of a second fuzzy set having small values, obtaining a minimum value therebetween, and obtaining a probability P2 that the first signal x[i+k] and the second signal y[j+k] have said small values;

(c) obtaining a maximum value between the probability P1 and the probability P2 and obtaining a probability P3 that the first signal x[i+k] and the second signal y[j+k] have said large values or said small values;

(d) increasing said k in units of integers from 0 to M-1, repeating (a) through (c), and obtaining M probabilities P3; and

(e) obtaining a correlation coefficient indicating a degree of similarity between the first signal x[i+k] and the second signal y[j+k] by adding said M probabilities P3.

28. A computer readable recording medium on which a program for implementing a method for determining a correlation coefficient between signals is recorded, said program having instructions comprising:

(a) applying a first signal x[i+k] and a second signal y[j+k] to the following equation and obtaining a probability P3 that the first signal x[i+k] and the second signal y[j+k] have large values or small values:

$$\max[\min(\mu_L(x[i+k]), \mu_L(y[j+k])), \min(\mu_s(x[i+k], \mu_s(y[j+k]))]$$

where k is an integer from 0 to M-1, said μ_L is a first membership function of a first fuzzy set having large values, and said μ_s is a second membership function of a second fuzzy set having small values;

(b) increasing said k in units of integers from 0 to M-1, repeating (a), and obtaining M probabilities P3; and

(c) obtaining a correlation coefficient indicating a degree of similarity between the first signal x[i+k] and the second signal y[j+k] by adding said M probabilities P3.